Historic American Engineering Record

HAER WV-21

Elkins Coal and Coke Co.:
Richard Ovens
Dellslow
Monongalia Co.
West Virginia

REDUCED 8" x 10" DRAWINGS

Addendum to:

Elkins Coal and Coke Company: Richard Ovens
Dellslow vicinity
Monongalia County
West Virginia

HAER No. WV-21

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U. S. Department of the Interior
P. O. Box 37127
Washington, D. C. 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

Elkin Coal and Coke Company: Richard Ovens

HAER No. WV-21

Location:	Dellslow vicinity, Monongalia County, West Virginia UTM: 17.594220.4384690 Quad: Morgantown South
Date of Construction:	1904
Present Owner:	Consolidation Coal Company
Significance:	After the Civil War, the expansion of the iron and steel industry led to increased demand for metallurgical coke, the principal fuel for blast furnaces. These beehive ovens are typical of the early coke industry.
Historian:	Dennis Zembala, 1975

ELKINS COAL AND COKE COMPANY: RICHARD OVENS

INTRODUCTION

The history of mining operations at Richard, West Virginia, offers a valuable look at the role of coal field development in the first great era of American industrial expansion. The nature of its beginning and its subsequent development tells much about the complex problems of industrial enterprise in a sparsely settled area. It also provides insight into the interrelationship of several industrial sectors in the general awakening of the late 19th and early 20th centuries. Development of the area's coal resources depended on the demand for coal and coke in the iron industries and on the construction of local railroad facilities. The growth in demand for iron was, in turn, fueled by the expansion of railroads, which was, in turn, stimulated by new coal development. The development of the Richard mine and coking operation is a case study which illustrates the local basis of this interplay of related elements.

Today, very little remains at Richard to indicate the nature of its beginnings. The activity which marked its early years has given way to the quiet somnolence more typical of its present status as a residential suburb of Morgantown. During the summer, the coke ovens lie concealed in the vegetation, which has overgrown the hillside. The two remaining mine buildings are used by a small machine shop, and the company offices have served as the local schoolhouse. A wholesale supply company occupies the former company store, and the old boarding house is now a private residence. Only the company houses remain, now privately owned, to indicate the origins of the community and the enterprise on which it once depended, and these have been altered and enlarged, destroying that sense of uniformity which once marked them as company housing.

Any attempt to realize the significance of the Richard enterprise in the industrial development of the surrounding area must account for the transformation of the community to its present state, as well as for its initial development. It is fortunate that enough remains of the site and the people who once occupied it to augment the written record of its history. The continued usefulness of the company houses points out the value of their location near Morgantown. The survival of the beehive coking ovens illustrates the solidity of the original design and tells much about the history of the operation. Although they went out of service in the early 1920's, they were not demolished or modernized, as were many other industrial sites of the period. Rather, industrial expansion occurred in nearby Morgantown, and many residents of Richard found employment there. Since there was no need to remove the ovens, they still remain as a small, but significant, reminder of the community's origins.

BACKGROUND

The rise of coke to a position of importance in American industrial history is closely linked to its use in the production of iron. The tremendous growth of the iron and steel industry in the latter half of the 19th century was dependent on the availability of a cheap and abundant supply of metallurgical coke for the blast furnace. Coke serves as both a source of heat and a reducing agent in the conversion of ore to iron. In the blast furnace, coke provides the carbon (which is almost 100% of its composition) to liberate the oxygen from the ore (an oxide of iron), leaving it in a pure metallic state. Until about 1850, almost all the iron smelted in the United States was produced using charcoal as the source of this carbon. As a result, the growth of the iron industry was dependent on large local supplies of wood. Although the use of coke for smelting purposes had been common in England since the 1780's, its introduction in this country was delayed because of the plentiful supply of wood and because of certain technical problems.

After about 1825, the diminishing forest in the east and the discovery of large deposits of coal in western Pennsylvania, Virginia, and Ohio increased the incentive for American iron masters to smelt iron with coke. This interest led to numerous experiments and investigations of English practices in the field. In 1825, William Strickland, the Greek Revival architect, was sent abroad by the Pennsylvania Society for the Promotion of Internal Improvements to bring back detailed information on the methods used to coke coal, the types of coal used, and the manner in which coke was used in the blast furnace. In 1835, the Franklin Institute offered a prize to the company which could manufacture the most iron using only coke as a fuel. [1] Numerous iron masters carried on experiments using coke in the blast furnace, but the practice did not catch on in a large way until after the Civil War. In 1865, the total amount of coke used in American blast furnaces was about 100,000 tons; by 1885, it had risen to over 2 million tons. Five years later, consumption stood at 10 million net tons. [2]

Early techniques for the production of coke were similar to those used to make charcoal. Lump coal was stacked in piles or "ricks" around a central chimney. These piles were then ignited with kindling and covered with fine coal dust to control the amount of oxygen available for combustion. After a proper period of controlled burning, the piles were quenched with water and the coke loaded for shipping. Since the pile was exposed to the elements, control of the process was haphazard at best. [3]

As demand for more and better coke increased, so did the drive to find more efficient methods of production. The introduction of the beehive oven, after 1850, led to a marked improvement in both the quality and the quantity of coke. The oven retained enough heat to ignite a new charge spontaneously and eliminated the necessity for wood kindling.

Its use also gave the coke burner greater control over the rate of combustion of the charge. Since coal varies a great deal in its percentages of sulphur, ash, moisture, and volatile matter, the oven provided the desirable flexibility to compensate for this fact during the process. As the knowledge of the chemical and physical processes of both the coking process and iron smelting was gradually refined, flexibility became even more important. Burning time could be adjusted to suit the type of coal used and the type of coke desired. [4] By 1892, there were 261 companies operating 42,000 such ovens and producing over 12 million tons of metallurgical coke for the iron and steel industry. [5]

The rapid growth of the industry stimulated further research into oven design, resulting in the modification of the classic beehive oven and to its gradual replacement. One of the major advances was the installation of various devices to capture the by-products of coking which had previously been expended into the atmosphere. As the demand for these products increased--ammonia, tar, and acids--these mechanisms became more common. At some plants, a system of flues was added under the hearths to capture waste gases for the generation of steam power. [6] Attempts to increase production through mechanization led to the displacement of the beehive oven by the Welsh-type oven. After 1890, numerous variations of this type began to appear in the major coke-producing areas and at the iron and steel plants. The basic shape of the Welsh oven was rectangular with an arched roof. The most widely adopted form had doors at either end, so the entire charge could be pushed out by machine. Since initial capital outlay for such an oven was much greater than for the beehive type, it was initially found only at the larger iron and steel companies, where greater capital resources meant that it was usually built complete with by-product devices. By the 1920's, the simple beehive, which had been the dominant type during the period of the industry's initial growth, had been relegated to a secondary role. Small beehive operations served primarily to augment the basic capacity of the modern ovens during periods of peak production in the iron and steel industry. The history of the coking operation at Richard tells a great deal about the reasons for the coal field development in this region and the way in which these large patterns took shape on the local level.

Because of its dependence on the construction of adequate rail transport, development of the northern West Virginia coal fields was delayed until the turn of the century. The Baltimore and Ohio and the Pennsylvania Railroad were hesitant to build new lines into Monongalia County, because both companies had already invested heavily in the larger coal fields near Clarksburg and Fairmont. The Baltimore and Ohio, whose route lay closest to the Monongalia field, also shipped large amounts of coal from the western Maryland coal field near Cumberland and Frostburg. Lack of interest on the part of the larger railroads meant that the construction of local facilities was left in

private hands.

Construction of the Morgantown and Kingwood Railroad was the work of entrepreneurs involved in the development of the area's coal reserves. After several abortive attempts to finance the road by public subscription, its assets were sold at auction to George C. Sturgiss, who extended it eastward to the Preston Company line in 1902. In 1907, Senator Stephen B. Elkins bought the M&K and completed the line to Morgantown & Kingwood Junction on the B&O. Elkins's first visit to the area was in 1890-1891, when he began buying up coal leases. [7] His interest in linking the Morgantown & Kingwood Railroad eastward to the B&O indicates that he evidently had some prospects for selling this coal in Baltimore, probably to the Maryland Steel Company plant at Sparrows Point. When the B&O finally purchased the M&K outright in October 1919, it did so "with the financial cooperation of the Bethlehem Steel Company." [8] Bethlehem had acquired Maryland Steel through its purchase, prior to 1914, of the parent Pennsylvania Steel Company, and was undoubtedly anxious for secure connections with the major sources of coal and coke for the Sparrows Point furnaces. When the Elkins interests sold the M&K to the Baltimore and Ohio, their coal mines and coke ovens were sold to the Penn-Mary Coal Company. [9] Four years later, they were acquired by the Bethlehem Mines Corporation, a holding company of Bethlehem Steel. [10] While the development of the Monongalia coal field was dependent on the introduction of transportation facilities, in this case the railroad, the controlling factor was the growing demand for coke in the iron and steel industry. Senator Elkins could only afford to build the M&K after he had secured a constant market for the coal and coke produced. The growth of the Bethlehem Steel Company after 1900 provided a new and increasing market for coal and for metallurgical-quality coke.

The Richard mine was opened early in 1903 by the Deckers Creek Coal and Coke Company, the original owner of the coal lease. Little is known of the company, and it is likely that it was organized principally for speculation in potentially valuable properties. Production in the first half of 1903 was a meager 120 tons, of which 20 tons was used to operate the mine. [11] That year, the lease was sold to the Elkins Coal and Coke Company, and production for the fiscal year ending June 30, 1904, increased to 33,928 tons. [12] All of this coal was shipped from the mine, and, since the M&K was not yet open to the east, it was probably sent by way of Fairmont. Late in 1904, Elkins began construction of ovens to turn the production of the mine into marketable coke. Of the nearly 24,000 tons of coal mined during the 12 months following June 30, 1904, over 17,000 tons was turned into coke. [13]

The beginning of full production at the mine was accompanied by the creation of a whole complex of related facilities. Before the advent of the automobile, it was not within reach of established population centers. Since the mine's location was a rural one in 1903, workers had

to be imported from other areas and furnished with food and housing. The company was forced to build an entire town for these men before providing facilities for the operation of the mine and the coking facility. Although no records remain to document the growth of the physical setting, there is little doubt that the workers' housing and a company store were among the first structures erected. Since many of these workers were unattached males, the company also built two boarding houses, in addition to the detached houses for those with families. [14] The company store provided the residents with food and dry goods, in addition to performing more informal community functions. Only after these basic necessities had been provided for could the company undertake the construction of structures more directly related to the production of coal and coke.

Because the coal at Richard was of good coking quality, one of the first priorities for construction was a facility for its conversion into coke. By June of 1905, 25 ovens were in operation, employing 20 men. One year later, the number of ovens had increased to 100 and the work force to 45. [15] Coke production during this period rose from 12,332 to almost 48,000 tons, an increase which matched that of the number of ovens. The coke ovens at Richard were all of the classic beehive type described by Fulton. [16]

Although the by-product modifications and the more mechanized Welsh-type oven were already well-known, the greater cost of such designs and the distance between Richard and the market for such by-products made them uneconomical. As a result, Elkins decided to build the simplest type of oven which would suit his needs. Each brick oven was 12 feet in diameter at the base. The walls extended vertically from the floor for seven courses to the springing point of the domed ceiling (see HAER drawing of section, sheet 2 of 2). At the apex of this vault was a circular ring of highly fired clay, whose lower edge was seven feet above the oven floor. The hearth and dome of each oven were of silica brick to resist the high temperatures of the coking process. The entire bank of ovens was fronted by a retaining wall of stone masonry, pierced at each oven by an arched door for removal of the coke. The space between the retaining wall and the hillside behind the ovens was filled level to the top of the oven crowns. Tamped clay was preferred for fill, since it retained a great deal of the heat given off during combustion. The fill also helped to support a set of tracks which ran over the circular openings and which carried the "larry," or hopper car, to fill the ovens. Finally, a wharf in front of the retaining wall served as a working space for the men who drew the coke from the ovens and loaded it into railroad cars for shipment. The level of this wharf was slightly above the tops of the gondola cars, whose tracks ran on a lower level. When finished, these ovens provided a simple but effective means for converting the mine's coal into high-quality metallurgical coke.

The coal used in the ovens at Richard was from the Upper Freeport seam, a highly desirable type for coking purposes. It was relatively high in carbon content and low in phosphorus and sulphur, an important factor since excessive sulphur and phosphorus in the coke produce a brittle iron when used in the blast furnace. [17] In addition to being relatively free of these substances, Upper Freeport coal contains about 35% volatile matter. It is these oily liquids which are given off as gases during the coking process. While not part of the final product of coke, their presence in the coal is extremely important. During combustion, it is the oxidation of these substances that provides the heat for fusion of the carbon. As they are released from the coal, they leave spaces and hence are responsible for giving the coke its cellular structure. This porous nature is desirable in blast furnace work since it increases the surface area of the coke and makes it burn rapidly at intense heat. [18] High-carbon coals are not as suitable for coking, since they are low in volatile gases and must give up some of their carbon to provide the heat of fusion. Such coals yield a dense, slow-burning coke, not nearly as suitable for iron production. Since the Elkins Company was selling its coke exclusively to a steel mill, the Upper Freeport coal at Richard was perfectly suited to its needs.

The organization and character of work at the Richard mine and ovens were fairly modern for its time. The mine was electrified by its own generating plant, and three Morgan-Gardner electric coal cutters were in use. These machines were used to "undercut" the seam, which was then shot down by dynamite. Seven men worked with each machine, loading the coal into cars for transport to the surface. Work was difficult because the Upper Freeport seam was low, about 3-1/2 feet. Because it was a drift mine, the entry was almost horizontal, providing good drainage, but the danger of explosion from dust and coal gas was constant. The workings were of the standard shaft-and-room type, and the original ventilation was provided by a furnace whose flue drew air from the faces. In 1906, a large fan was installed to provide more adequate ventilation. The coal was loaded into cars in the rooms and drawn by mules to the main shaft, where an electric tram hauled it to the entry and thence to the tipple. By 1906, there were 65 miners loading coal at the mine. [19]

Work at the coke ovens was typical of the methods used at the time. [20] The coal was loaded into larry cars at the tipple and carried to the ovens on the track which ran over the charging hole. After it was dumped into the oven, the coal was leveled from the front by a man with a curved spade on the end of a long pole. The oven door was then closed with firebrick and plastered over, leaving a small crack at the top for the entry of air. As the burning progressed, this crack was gradually closed to slow the process and prevent oxidation of the carbon. A skilled "coke burner" was placed in charge of this work, and it was his function to decide when the burning was sufficiently advanced to justify the further sealing of this flue. Since the process varied considerably in proportion to the size of the charge and the condition

of the coal, the coke burner depended on experience to tell him when to make the necessary adjustments. [21]

Once the burning was complete, the door was opened and the mass of coke was quenched with water. This, too, was a skilled operation, since the worker who performed this task had to use enough water to stop combustion, yet only cool the oven to the point where the next charge would ignite spontaneously. Once the charge was quenched, it was the task of the "coke puller" to remove the mass from the oven and carry it to the railroad cars. This operation was performed entirely by hand. During the process, the lump coal was fused into a solid mass which had to be broken up before removal from the oven. This was a difficult job requiring great strength, and the coke pullers were generally of the brawnier sort. Working in front of a hot oven for 10 hours, an exceptional man could pull four ovens in a day. [22] In 1906, the Richard operation employed 35 coke workers, of which probably 20 were pullers. Ten laborers assisted these men by carrying the coke in wheelbarrows from the ovens to the cars. [23] This system of work endured as long as coke was produced at Richard--well after the introduction of electric pulling machines in nearby operations. [24]

When the Richard mine was acquired by Bethlehem, certain improvements were made in the physical plant. The entries were widened to remove the danger of a man being crushed between the wall and the loaded cars--a frequent source of mine accidents at the time. A new brick office (in 1974, the Richard School) replaced the old frame structure built by Elkins. [25] In 1940, a new company store was built when the original was destroyed by fire. [26] Since the capital resources of Bethlehem Steel were greater than Elkins's, Bethlehem was in a better position to make such improvements. More emphasis was placed on mine safety and regular competitions were held between rescue teams from the company's mines. Former employees seem to agree that the conditions of work were much improved under the new owners. [27]

Bethlehem Steel continued operations at Richard consistent with its needs. From the mid-1920's until 1935, the mine was shut down because of a slack period in the steel industry. During this period, some of the workers were sent to the company's other mine at nearby Bretz. [28] Others moved to the new fields being opened up west of the Monongahela at Sage, Scotts Run, and Bunker. [29] Mining resumed in 1935 and hit a peak during the early 1940's, when World War II stimulated demand for iron and steel. By this time the company had expanded its coking facilities at the mills, and coke was no longer produced at the mine. The poor economic climate following the war forced the company to liquidate some of its holdings. In 1944, the mine properties were sold to Consolidation Coal Company, the present (1973) owner, and mining ceased in 1951. The company housing was sold through the Fairmont Investment Corporation, which gave the tenants first option to buy.

The significance of the Richard coal and coke operations lies hidden by the recent transformation of the community into a suburb of Morgantown. The remaining artifacts do little to convey the vitality of rural industrial enterprises which marked its early years. The beginnings of the coal and coke operations and the construction of transportation facilities and housing turned an isolated river bottom into a scene of lively activity. Workers, many of them newly-arrived immigrants, were brought in from other areas and provided with food, shelter, and work. Labor was difficult and hazardous, and the living conditions were cramped and crude. Yet, the increasing demand for coke in the iron and steel industry insured a fairly constant demand for workers. Even after the old beehive ovens were shut down, the coking qualities of Freeport coal assured continued operation of the mine until the late 1940's. The coal was shipped to Bethlehem's Sparrows Point plant, where it was coked in more efficient, modern ovens, which captured the by-products of the process.

After the mine was shut down and the housing sold, many of the workers remained. Some of them found employment in the new mines being opened west of Morgantown. Others found jobs in Morgantown, where the post-war growth of the university alleviated the effects of the industrial recession. Automobiles had given workers mobility, and it was no longer absolutely necessary to live close to their jobs. If the isolated, self-sufficient community of its early days had been the result of the railroad's unique ability to merge the factors of production, it is somehow fitting that Richard's continued existence and prosperity is the result of another revolution in transportation.

Footnotes

1. John Fulton, Coke (Scranton, Pennsylvania, 1895), pp. 93-94; James M. Swank, History of the Manufacture of Iron in All Ages (New York, 1965), pp. 366-368.

2. Swank, p. 371.

3. Coke Oven Managers Association, The History of Coke Making and of the Coke Oven Managers Association (Cambridge, 1936), pp. 25-34.

4. Fulton, pp. 244-252.

5. Ibid., p. vii.

6. Ibid., pp. 186-229.

7. James M. Callahan, History of the Making of Morgantown (Morgantown, 1926), p. 246.

8. Ibid., p. 281n.

9. Monongalia County Clerk, Deed Books, Vol. 161, p. 28; Vol. 191, p. 117. Hereinafter cited as Deed Book (Vol.).

10. Deed Book 198, p. 481.

11. West Virginia Department of Mines, 21st Annual Report (Charleston, 1904), p. 21. Hereinafter cited as Annual Report (date).

12. Annual Report (1905), p. 20. Although Elkins purchased it in 1903, it continued to appear in the annual report under its former name until 1906.

13. Annual Report (1906), p. 24.

14. Interview with Wade Mayfield, former employee, January 1975.

15. Annual Report (1905), p. 73; (1906), p. 80.

16. Fulton, pp. 110-117.

17. Ibid., p. 37.

18. Ibid., pp. 26-27.

19. Annual Report (1905), pp. 73, 198; (1906), pp. 113-114, 246-247.

20. Fulton, pp. 112-121.

21. Interview with Steve Kassner, coke-burner at Mercury Coal and Coke Company, Bretz, West Virginia, 1973.

22. Mayfield interview.

23. Annual Report (1906), p. 80.

24. Mayfield interview.

25. Ibid.

26. Interview with Reno Buffalo, former employee, January 1975.

27. Mayfield and Buffalo interviews.

28. Buffalo interview.

29. Interview with Ruth Johnson, former employee, January 1975.

Bibliography

Buffalo, Reno. Taped interview. January 1975.

Callahan, James M. History of the Making of Morgantown. Morgantown, 1926.

Coke Oven Managers Association. The History of Coke Making and of the Coke Oven Managers Association. Cambridge: W. Heffer & Sons, Ltd., 1936.

Fulton, John. Coke. Scranton, Pennsylvania: The Colliery Engineer, 1895.

Johnson, Ruth. Taped interview. January 1975.

Mayfield, Wade. Tapied interview. January 1975.

Monongalia County Clerk. Deed Books. Morgantown, West Virginia.

Swank, James M. History of the Manufacture of Iron in All Ages. 2nd ed. New York: B. Franklin, 1965 [1844].

West Virginia Department of Mines. Annual Reports. Charleston: Tribune Printing Co., 1883-Present.